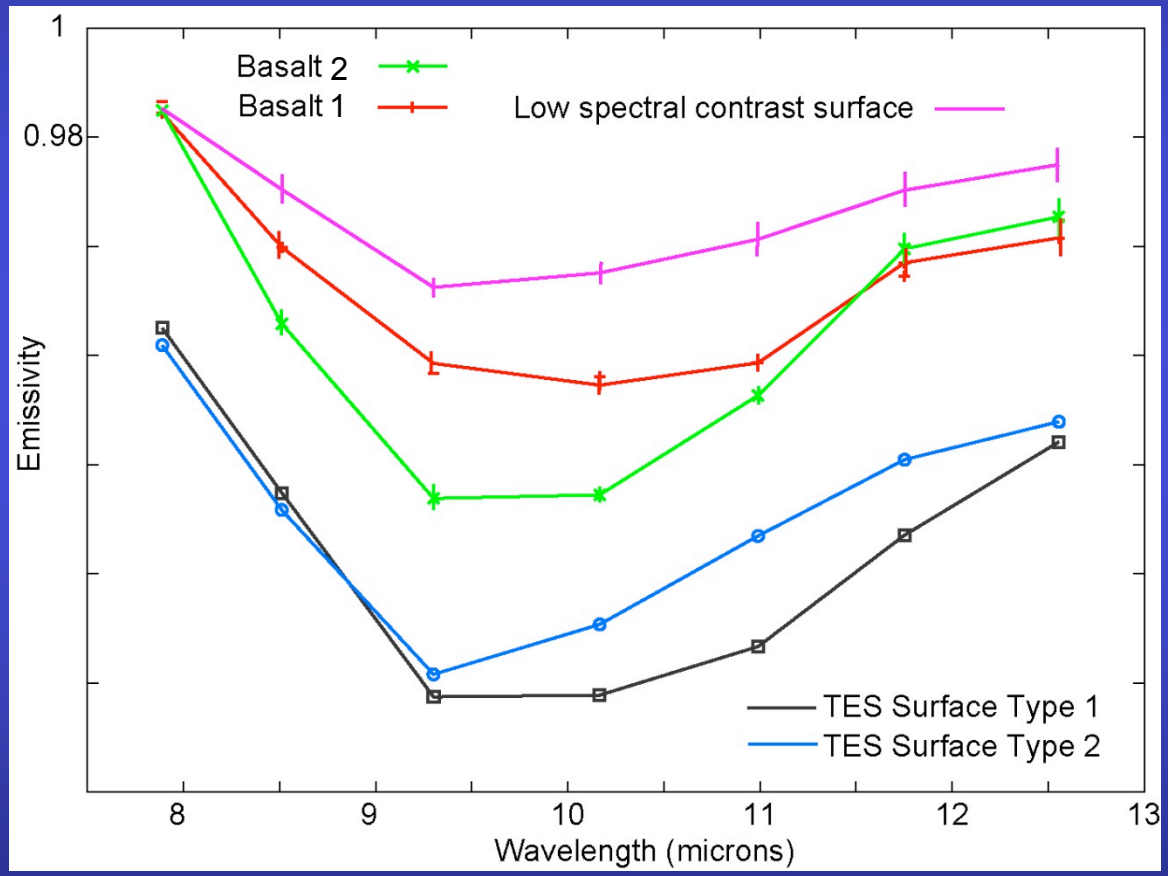
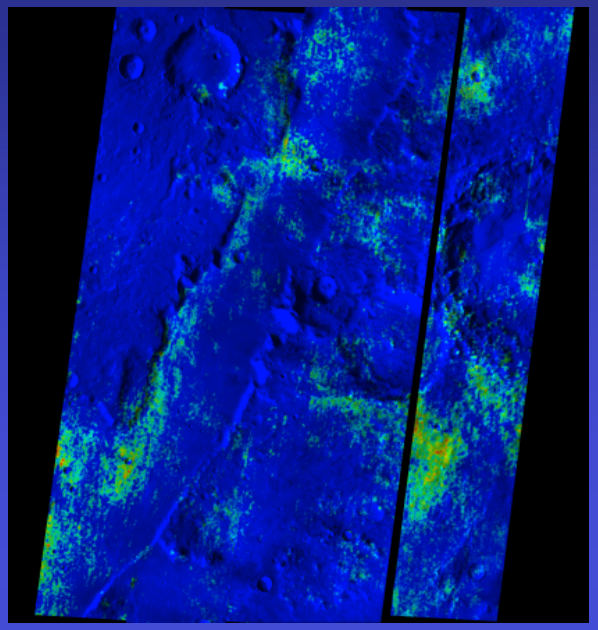
Nili Trough THEMIS spectral endmembers

- Basalt 1 surface is similar to Surface Type 1
- Basalt 2 surface is intermediate between TES Surface Types 1 and 2
- Dust and blackbody distributions represent varying contributions from dust or particle size /surface texture

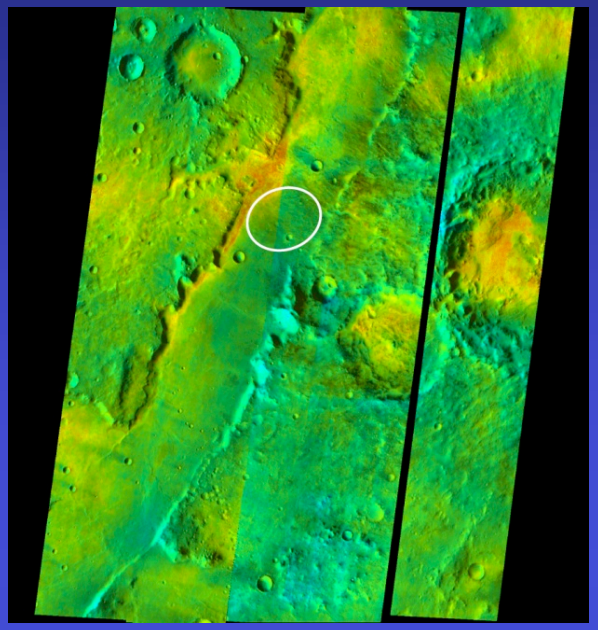


Nili Trough

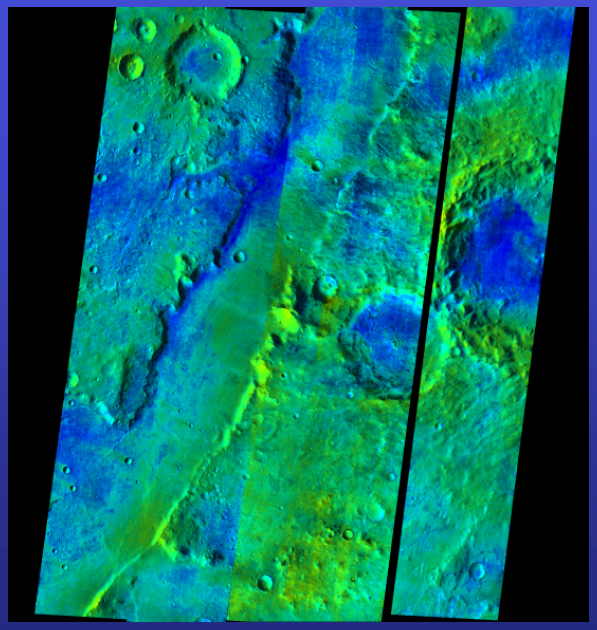
THEMIS spectral unit mosaics



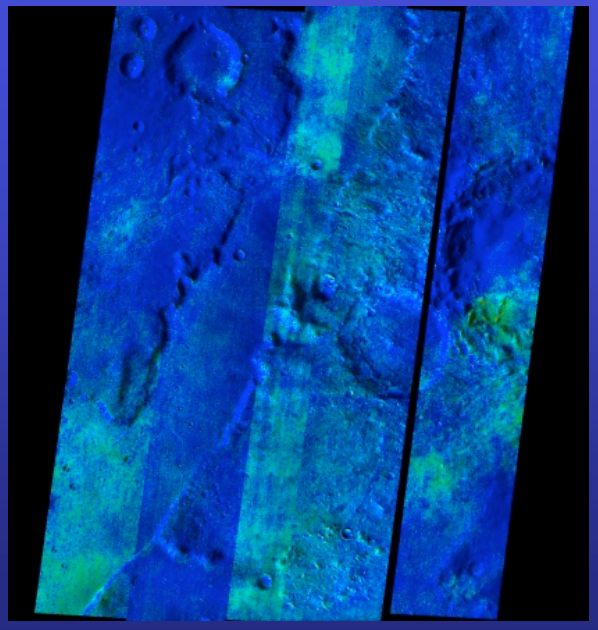
Basalt 1
Olivine
(0-0.10)



Basalt 2
(0-1.3)



Blackbody/
dust
(0 to 1.0)

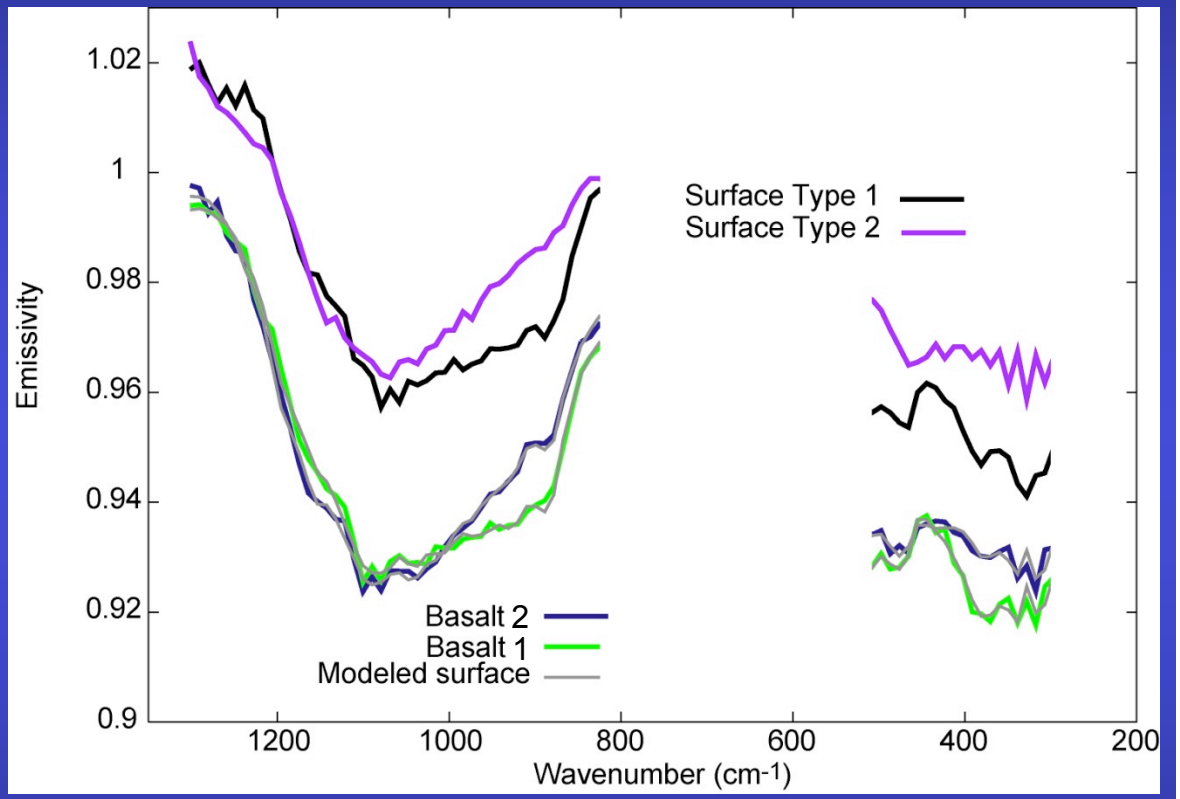


RMS Error
(0-0.01)

Nili Trough

TES analysis of THEMIS spectral units

- All surfaces have significant plagioclase, pyroxene, with lesser high silica phases (~15-35%)
- Olivine/pyroxene are inversely correlated with high silica phases
  - Similar to global Surface Types 1 and 1/2
  - Differences are slight, but may be consistent with variable alteration?

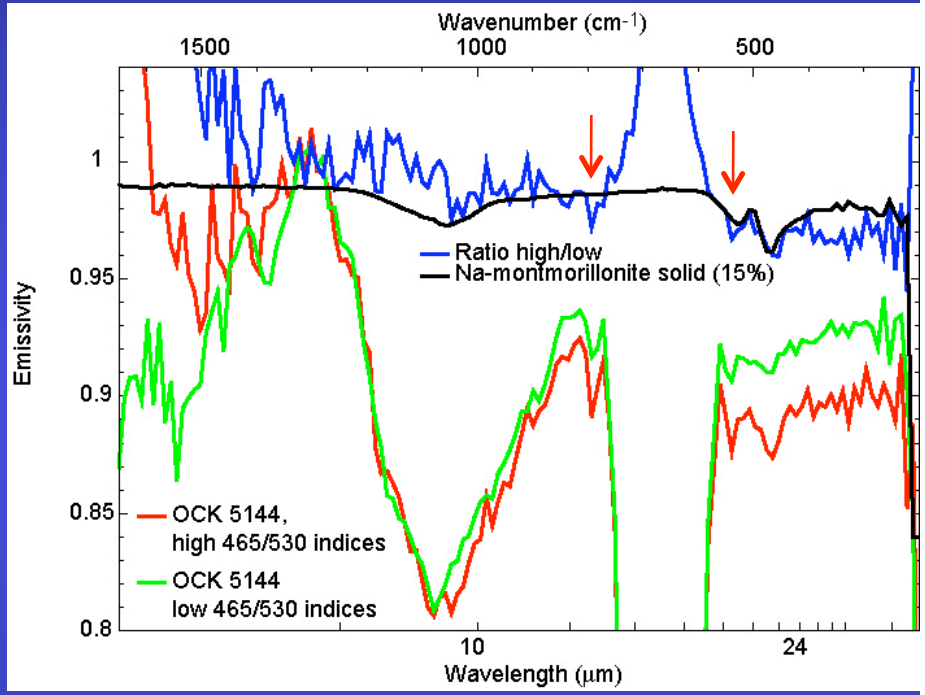


Nili Trough

TES Indices and Ratios

- Ratio spectra and 465 and 530 cm^{-1} indices can give a more precise indication of phyllosilicates (*Ruff and Christensen*, 2007)

- Ratio spectrum has strong 465 cm^{-1} feature but smectite doublet is absent
  - Only 1 "detection" using ratios and indices – false positive due to CO_2
  - Upper limit on phyllosilicate abundance: 10-20% (can be much higher if present as loose, fine particles)
  - Similar to Marwth analysis but Mawrth has additional high-Si phases present within phyllosilicate areas



Nili Trough

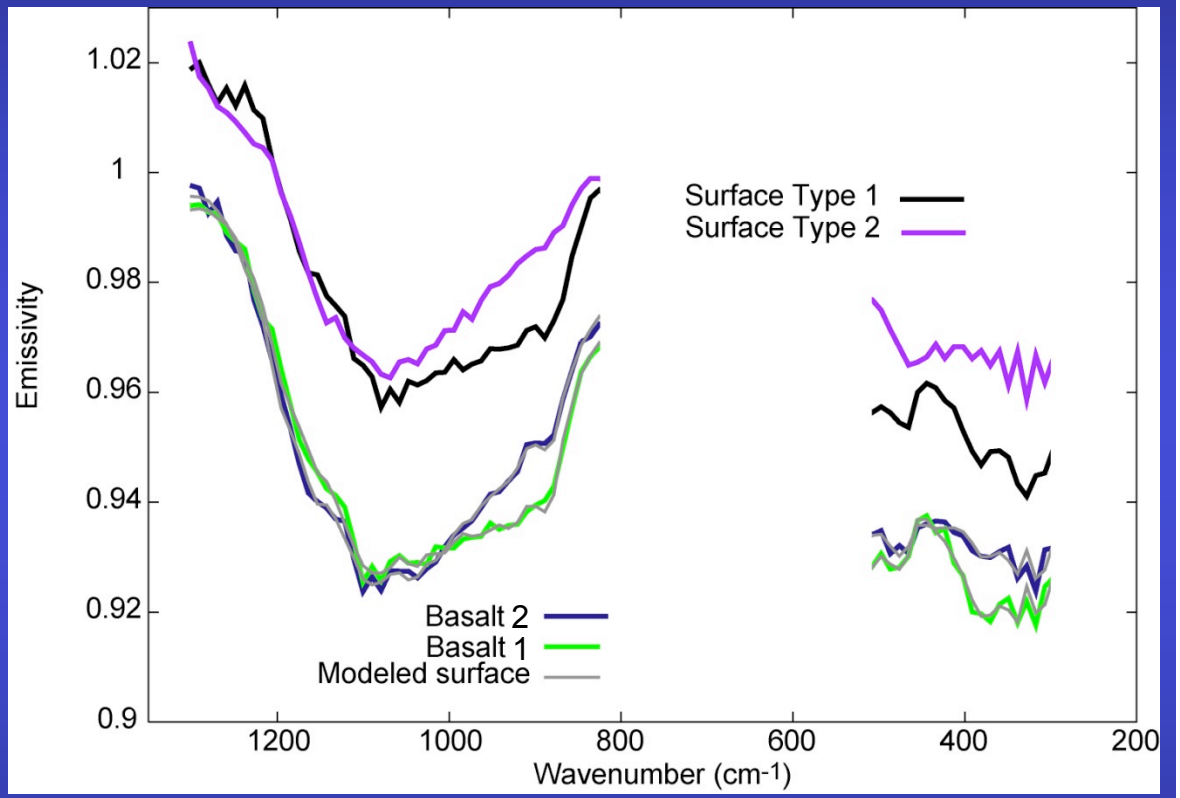
Summary

- Two units with compositions similar to basalt are identified in TES/THEMIS data
  - Both contain significant plagioclase, pyroxene, and high-silica phases
  - Units are distinguished by inversely correlated olivine/pyroxene and high-silica phase abundance and differences are likely attributed to slight alteration
- Phyllosilicates observed by CRISM are not clearly detected with deconvolution, indices, or ratios
  - The disparity can be attributed to low abundance or texture/particle size effects
- TES dust cover index values and THEMIS data indicate moderate-to-low dust cover in the region
- Similar to Mawrth Valles, but compositional variation is not as strong and possible alteration products are not as significant in TIR data

TES analysis of THEMIS spectral units

Modeled abundances

Basalt 1	
Feldspar	33 +/- 4 %
Pyroxene	29 +/-
Olivine	9 +/- 3
High-silica*	15 +/- 5
Other**	13
Basalt 2	
Feldspar	32 +/- 5 %
Pyroxene	26 +/-
Olivine	6 +/- 2
High-silica*	20 +/- 4
Other**	17



*"High-silica phases": silica glass, opal, zeolite, clay (cannot reliably distinguish these)

**Other: carbonate, sulfate, hematite, amphibole, quartz (individually modeled at 0-9%, below det. limits)

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